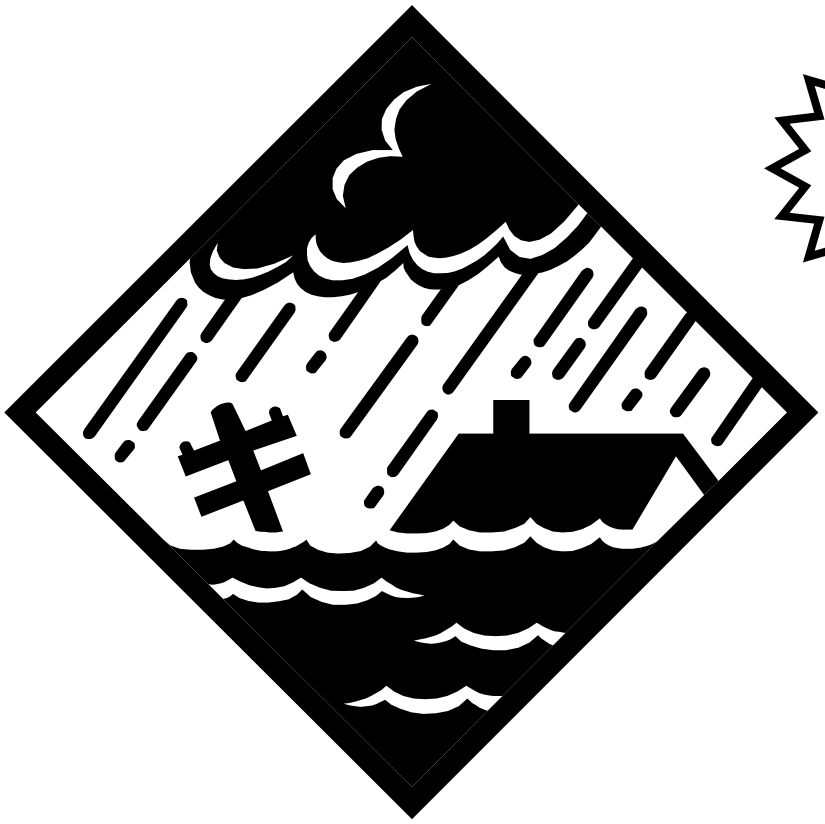
FLOODPLAIN MANAGEMENT

A Local Floodplain Administrator's Guide to the National Flood Insurance Program



3rd Edition

Prepared by the
Federal Emergency Management Agency
Region 10

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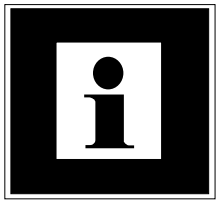

For additional information or copies of this guidebook, please contact:

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NFIP Guidebook Attachments

Mapping and Map Revisions (Chapter 3)

- Elements of a Flood Insurance Rate Map ..... **Tab 1**
- Using the Floodway Map ..... **Tab 2**
- Using Flood Profiles to Determine Flood Elevations ..... **Tab 3**
- Limitations of Flood Insurance Studies ..... **Tab 4**
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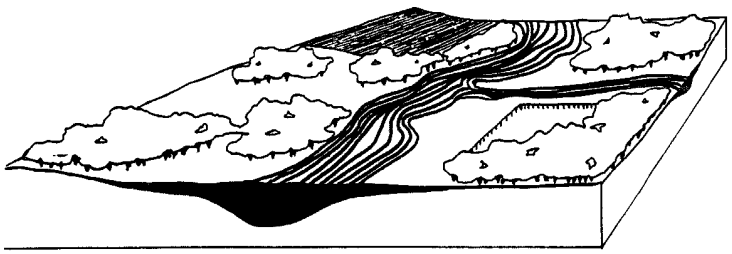
NOTE: These attachments are only included in the complete NFIP guidebook, and are not attached to this stand-alone Floodplain Management booklet.

1. Introduction

Flooding is a *natural* occurrence. Periodically, rivers, streams and lakes will overflow their banks and inundate adjacent land areas. These areas, known as floodplains, temporarily store this excess water. Flood damages only arise when man interferes with the natural flooding process by altering the watercourse, developing areas in the upper watershed, and/or building inappropriately in the floodplain itself.

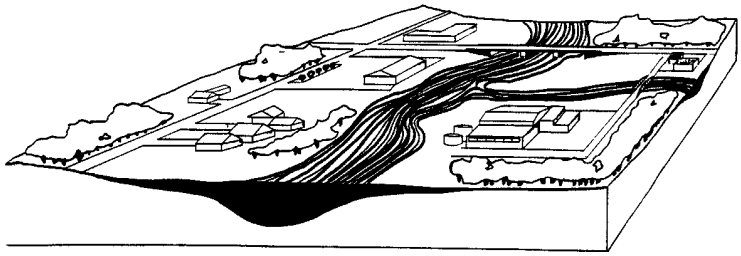
The traditional solution to flood problems has been to construct structural protection works such as dams, diversions, levees and floodwalls. Despite tremendous expenditures for these structural projects, economic flood losses have continued to increase year after year. Given this, governments at every level have begun to see the solution to avoiding flood damages lies not in keeping the water away from people, but rather in keeping people away from the water. This philosophical shift lead to the creation of the National Flood Insurance Program (NFIP) in 1968, thereby codifying the concept of floodplain management.

The basic purpose of the NFIP is not to prohibit floodplain development, but to guide development in floodplain areas in such a way as to greatly lessen the economic loss and social disruption caused by impending flood events. The purpose of this guidebook is to assist local officials in their understanding of the NFIP and the procedures that communities should follow in administering their floodplain management ordinances.



Flooding is a natural occurance. Floodplains are "built" by rivers.

Fact: A recent study showed that only 2% of the claims paid for flood damages are for post-FIRM structures (structures built after the date of a community's flood map and adoption of a local FPM ordinance), whereas 98% of the claims paid are for older or pre-FIRM structures. This is strong evidence that the NFIP is successful at protecting new developments.



Flood damages result when people build on floodplains without taking the river into account.

2. Floodplain Management Concepts

The Base Flood – Sometimes referred to as the 100-year flood, the base flood has a 1% chance of occurring in any given year. Although a 100-year flood sounds remote, keep in mind that over the life of an average 30-year mortgage, a home located within the 100-year flood zone (A or V zone) has a 26% chance of being inundated by the base flood over the life of the mortgage. The same home has less than a 1% chance of fire damage during the same period.

Flood Frequency (years)	Chance in any year	Percent chance during 30-year mortgage
10	**10 out of 100**	**96%**
50	**2 out of 100**	**46%**
100	**1 out of 100**	**26%**
500	**0.2 out of 100**	**6%**

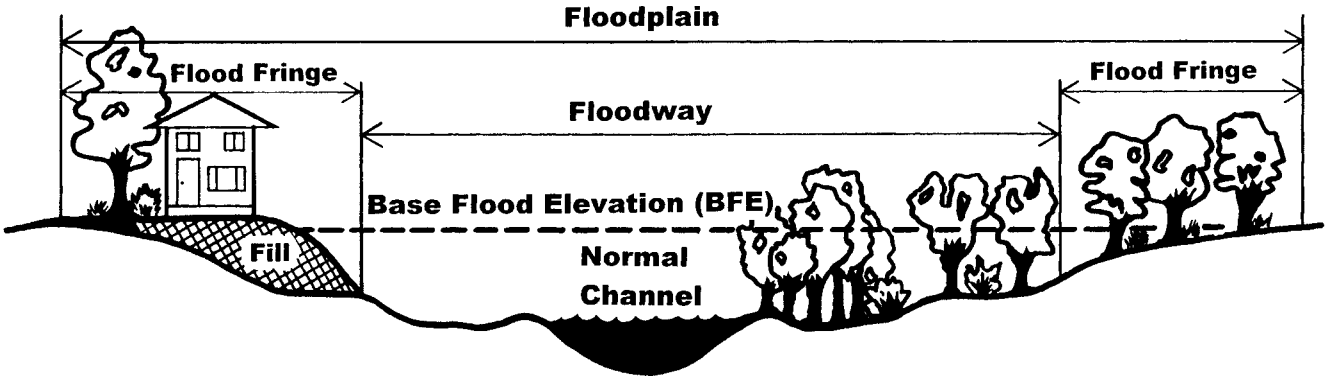
What is more significant is that the house in this example is almost certain to see a 10-year flood (96% chance) in the same 30-year mortgage cycle. In many areas the difference of flood heights between a 10-year and a 100-year event may be as little as one foot!

The Base Flood Elevation (BFE) – The BFE is the elevation (normally in feet above sea level) which the base flood is expected to reach.

The Special Flood Hazard Area (SFHA) – For purposes of the NFIP, the area that would be inundated by the base flood is also called the special flood hazard area (SFHA), or simply *the floodplain*.

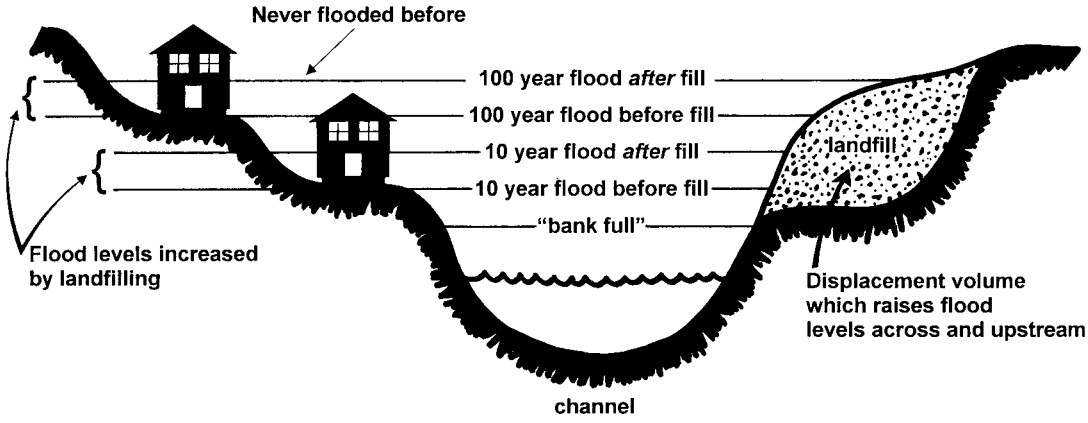
Floodway – Typically the channel of a river or stream and the overbank areas adjacent to the channel. The Floodway carries the bulk of the floodwater downstream and is usually the area where water velocities and forces are the greatest and most destructive. Regulations require that the floodway be kept open so that flood flows are not obstructed or diverted onto other properties.

Flood Fringe – The area on either side of the floodway is called the flood fringe. This area is subject to inundation by the base flood but conveys little or no velocity flows.



Fill – By nature, floodplains are low-lying areas which seem to invite filling activities. Filling is included under the NFIP definition of "development" and therefore requires a floodplain development permit. Care should be taken to ensure that the fill will not alter drainage or divert flood water to other properties.

Too much fill causes the river to rise higher…



(Note: this illustration is not to scale)

RESOURCES:

FEMA Publication "Protecting Floodplain Resources, A Guidebook for Communities"

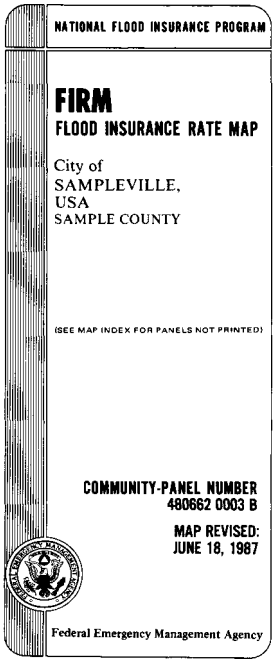
3. Mapping and Map Revisions

Floodplain Maps

Floodplain maps are the basis for implementing floodplain regulations. The maps vary in detail depending on several factors including the amount of historical data, the detail of the base topographic maps, the flood threat, and the floodplain development potential. There are basically three types of floodplain maps:

1. **Flood Hazard Boundary Map (FHBM)** A very generalized map usually issued to a community when they first join the NFIP. FHBMs do not include Base Flood Elevations (BFEs). Only a handful of communities still possess these basic flood maps.

2. **Flood Insurance Rate Map (FIRM)** Most communities have a FIRM. They generally include BFEs and flood zones and are based on a detailed study. With the FIRM, flood elevations at any specific development site within a community can usually be determined. More recently published FIRMs include both BFEs and regulatory floodways.


NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

City of
SAMPLEVILLE,
USA
SAMPLE COUNTY

(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
480662 0003 B

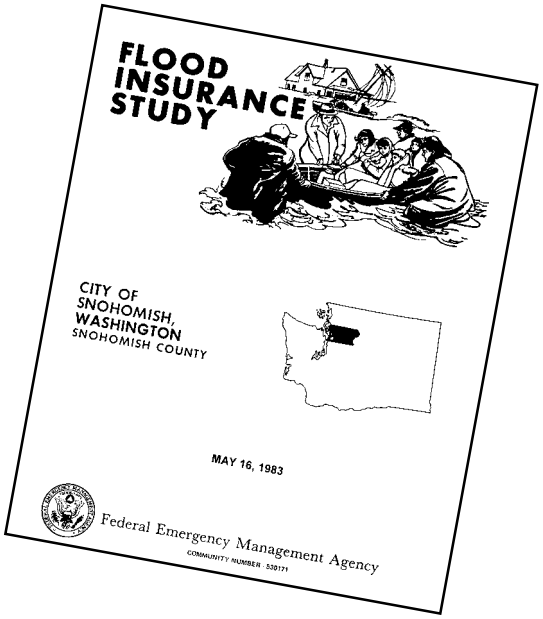
MAP REVISED:
JUNE 18, 1987

Federal Emergency Management Agency

3. **Flood Boundary and Floodway Map**
These maps delineate floodways but do not give BFEs or flood zones. A community must use its FIRM to identify BFEs. Newer FIRMs eliminate the dual maps; all information, including floodways, is on the newer FIRMs.

The Flood Insurance Study

The Flood Insurance Study (FIS) is prepared by FEMA to determine the flood hazard present in the community as well as the insurance zones that will be used to write flood insurance. The data in the FIS is used to produce the flood maps mentioned above. The FIS provides detailed and accurate flood hazard information that includes a written report containing a description of a community's flooding conditions, and flood profiles showing the 500, 100, 50 and 10-year flood elevations for each stream reach studied in detail.



There are two types of study approaches used:

Approximate

The approximate study, depicted as zone A on the FIRM, delineates the "100 Year" floodplain boundaries. The boundaries are established by reviewing existing data such as a Flood Hazard Boundary Map, USGS Flood Prone Quadrangle Map, US Army Corps of Engineer Floodplain Information report, and other historical data and transferring this information to the FIRM. If no existing data is available, then a rough hydrologic analysis is performed to determine the width of the floodplain. The approximate study generally involves little or no field work. The base flood elevation or depths *are not* determined. These areas are also referred to as **unnumbered A-Zones**.

Detailed

The detailed study uses considerably more specific hydrologic and hydraulic engineering methods. The detailed study is depicted as numbered A zones (A1-A30), AE, AH, and AO zones. Detailed survey work is conducted in the field for use in the hydrological and hydraulic analysis. The data from cross sections of the floodplain are inputted into a mathematical model (HEC-2 or HEC-RAS) and base flood elevations *are* determined. This often will also include delineation of a floodway and the 500-year floodplain.

-Flood Insurance Risk Zone Designations-

Zone	Description
A	Special Flood Hazard Areas inundated by the 100-year flood; base flood elevations are not determined.
A1-A30 **AE**	Special Flood Hazard Areas inundated by the 100-year flood; base flood elevations are determined.
AO	Special Flood Hazard Areas inundated by the 100-year flood; with flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths are determined. For areas of alluvial fan flooding, velocities are also determined.
AH	Special Flood Hazard Areas inundated by the 100-year flood; flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations are determined.
AR	Special Flood Hazard Areas that result from the decertification of a previously credited flood protection system that is in the process of being restored to provide a 100-year or greater level of flood protection.
AR/A1-A30 **AR/AE** **AR/AH** **AR/AO** **AR/A**	Special Flood Hazard Areas that result from the decertification of a previously credited flood protection system that is in the process of being restored to provide a 100-year or greater level of flood protection. After restoration is complete, these areas will still experience residual flooding from other flooding sources.
A99	Special Flood Hazard Areas inundated by the 100-year flood to be protected from the 100-year flood by a Federal flood protection system under construction; no base flood elevations are determined.
V	Special Flood Hazard Areas inundated by the 100-year flood; coastal floods with velocity hazards (wave action); no base flood elevations are determined.
V1-V30 **VE**	Special Flood Hazard Areas inundated by the 100-year flood; coastal floods with velocity hazards (wave action); base flood elevations are determined.
B ***or*** **X (shaded)**	Areas of 500-year flood; areas subject to the 100-year flood with average depths of less than 1 foot or with contributing drainage area less than 1 square mile; and areas protected by levees from the base flood.
C ***or*** **X (unshaded)**	Areas determined to be outside the 500-year floodplain.
D	Areas in which flood hazards are undetermined.

Map Revisions

Sometimes it is necessary for floodplain data to be revised. In most instances, FEMA will not republish an entire map, but will simply issue a letter which revises the flood map. Generally, there are five reasons why a flood map may need to be changed:

1. Revisions to correct a minor error
2. Revisions based on better ground elevation data
3. Revisions based on authorized filling in the floodplain
4. Revisions based on better flood data
5. Revisions based on new flood works

There are three primary types of map revisions:

1. Letter of Map Amendment (LOMA)

- A LOMA is a procedure in which FEMA reviews technical data submitted by the property owner who believes a property or structure was incorrectly included in a designated flood hazard area. (MT-1 Form)
- A LOMA amends the current floodplain map and establishes that the property or structure is not located in a special flood hazard area.
- LOMAs are used to verify that natural ground elevations are above the base flood elevation (BFE).
- LOMAs can waive the flood insurance requirement for loans if accepted by the lender.
- An Elevation Certificate (EC) supports a LOMA but, by itself, does not remove the insurance requirement.

2. Letter of Map Revision Based on Fill (LOMR-F)

- A LOMR-F removes land from the SFHA that has been graded or filled (physical changes) since the date of the map. (MT-1 Form)
- Communities must concur with requests before a LOMR-F is approved by FEMA.
- LOMR-Fs also can waive the flood insurance requirement for loans.
- LOMR-F requests for multiple lots must certify compaction of fill.

3. Physical Map Revision (LOMR PMR)

- Any Map revision other than simple fill, requires an engineering analyses—e.g. bridge, culvert, channel, levee, berm, hydrology, hydraulics, or combination thereof. (MT-2 Form)

How is a LOMA/LOMR-F Issued?

Requests for LOMAs and LOMR-Fs are now required to be submitted on forms provided by FEMA which include the following information:

- *Property Information Form* - may be completed by property owner
- *Elevation Information Form* - must be completed by a licensed engineer or land surveyor
- *Summary of Elevations (Individual Lot Breakdown Form)* - must be completed by an engineer or land surveyor if more than one lot is involved.
- *Community Acknowledgement Form* - used for LOMR-Fs completed by community.
- *Certification of Fill Compaction Form* - used for LOMR-Fs greater than a single lot, completed by an engineer or community.

To receive a MT-1 form packet (LOMA/LOMR-F) contact FEMA Region 10 or find the packet on FEMA's web site at http://www.FEMA.gov

LOMA/LOMR-F requests for both single and multiple lots are submitted to FEMA Headquarters in Washington D.C. and take three to six weeks to process.

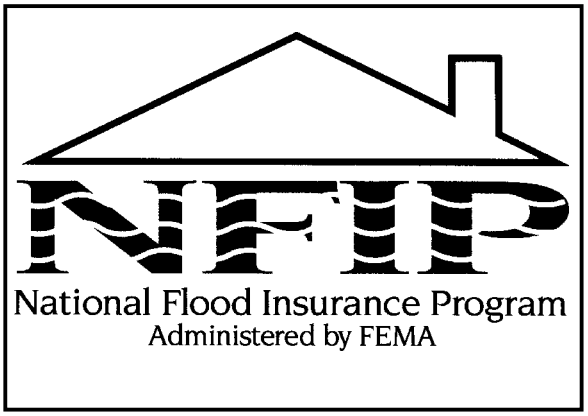
Questions on how to complete the LOMA/LOMR-F forms, or to check the status of a LOMA/LOMR-F --- please call the FEMA Map Assistance Center at 1-877-FEMA-MAP, or call FEMA Region 10.

RESOURCES:

Tab 1 Elements of a Flood Insurance Rate Map
Tab 2 Using the Floodway Map
Tab 3 Using Flood Profiles to Determine Flood Elevations
Tab 4 Limitations of Flood Insurance Studies
Tab 5 Letter of Map Amendment/Revision Packet (MT-1)
Tab 19 FEMA/State Contact List
Tab 21 Higher Regulatory Standards
FEMA Publication 258, "How To Use a Flood Map to Protect Your Property"
FEMA Publication 265, "Mapping Floodplain Development in Approximate Zone A Areas, A Guide for Obtaining and Developing Base (100-year) Flood Elevations"
FEMA Publication #311 "Substantial Damage Estimator"

4. The National Flood Insurance Program

To participate in the National Flood Insurance Program (NFIP), a community must adopt and enforce a floodplain management ordinance that regulates development in the community's floodplain. The two fundamental objectives of the NFIP are: (1) to ensure that new buildings will be free from flood damage; and, (2) to prevent new developments from increasing flood damages on existing properties. It should be noted that the NFIP is but one component of a community's floodplain management program.



The National Flood Insurance Program was created by Congress in 1968 to minimize the ever rising disaster relief costs and to reduce the loss of life and property caused by flooding. The Program has four goals:

1. **Provide flood insurance coverage not generally available in the private market.**
2. **Stimulate local floodplain management to guide future development.**
3. **Emphasize less costly nonstructural flood control regulatory measures over structural measures.**
4. **Reduce Federal disaster costs by shifting the burden from the general taxpayer to floodplain occupants.**

The Community Assistance Visit (CAV)

Approximately every two to four years, the Federal or State flood insurance coordinator(s) will visit your community to conduct a Community Assistance Visit (CAV). The purpose of the CAV is to assist the local floodplain coordinator and other local officials in enforcing the community's floodplain management ordinance. The CAV also seeks to evaluate the local floodplain management program vis-à-vis the regulations governing the NFIP. A CAV includes the following: a meeting with local staff to discuss procedures used in issuing development permits and review permit files; a check of building permits and elevation documentation to see if new development is being regulated according to the requirements of the local code; and a tour of the flood hazard areas. A follow-up letter is sent to the chief elected official, and a report is filed with the Federal Emergency Management Agency on the findings of the visit.

Typical NFIP CAV Findings

- **Record Keeping Systems**—Often, record keeping systems are not adequate to assure that elevations are adequately communicated prior to construction, and maintained properly so that subsequent buyers will not have to pay for another elevation survey.

- **Permits for "Other Development"**—Many communities, although they have adequate floodplain management ordinances, do not have a permit process to cover all "other development", which includes such activities as mining, drilling, dredging, grading, paving, excavations and filling in flood hazard areas.

- **As-Built Elevation Certificates**—Communities do not often secure as-built certifications of the lowest floor elevation. Elevation documentation based on plans and drawings is insufficient to assure that the lowest floor of the structure has indeed been built above the BFE.

- **Definition of Lowest Floor**—There is often misunderstanding regarding space below the lowest floor. Basically this should only be a crawl space with proper openings or an unenclosed garage.

- **Floodway Encroachment**—All encroachments, including fill, new construction and substantial improvements within the regulatory floodway are prohibited – unless an engineered no-rise analysis is done.

- **Floodproofing**—Only non-residential structures can be floodproofed, and then only dry-floodproofed (water tight).

- **Alteration of Watercourses**—Although there is no prohibition against altering watercourses (except in a designated floodway), there is a requirement to notify adjacent communities, the State Coordinating Agency and FEMA.

- **Mobile Home Anchoring**—All mobile homes placed in a flood hazard area are required to be anchored to a permanent foundation, including those in existing mobile home parks.

Note: Chapter 6 "NFIP Development Standards" provides a detailed explanation of each of the issues listed above.

About Flood Insurance

- Federal flood insurance is only available in those communities that participate in the National Flood Insurance Program.
- Flood insurance is required for federally-backed loans to purchase or build structures located in any special flood hazard area.
- In order to receive Federal disaster assistance in identified floodplains, communities must participate in, and be in good standing with, the NFIP.
- Flood insurance can be purchased from any agent who is licensed to write property and casualty insurance.
- Flood insurance can be purchased for any walled or roofed building anywhere in a participating community regardless where the structure is located.
- The NFIP does not cover basement contents or finished portions of a basement.
- Rates are subsidized for Pre-FIRM buildings; actuarial rates for Post-FIRM structures.
- There is a waiting period of 30 days before coverage goes into effect.
- There is no waiting period when transferring titles of properties to new owners.

Effects on Lenders

The purchase of flood insurance applies to all mortgage properties which fall under one of the following three criteria: the owner is applying for a federally backed (VA, FHA, etc.) loan; the lending institution is federally regulated; or the loan will be sold on the secondary market to a Government Sponsored Enterprise (GSE) such as Fannie Mae or Freddie Mac. This comprises well over 95% of all mortgage loans made each year.

The lender must first determine whether the structure is in a Special Flood Hazard Area (SFHA). This is done using an approved Standard Flood Hazard Determination Form.

For all properties located in a SFHA, lenders must require flood insurance when making, increasing, extending or renewing a loan. This requirement only applies when the structure is in the SFHA, not the lot. Lenders must ensure that coverage remains in effect for the life of the loan. A GSE such as Fannie Mae or Freddie Mac must ensure that any loans they purchase have flood insurance, if required.

If a loan has escrows for taxes, insurance or for any other reason, the lender must then escrow for flood insurance too. Lenders are required to notify borrowers if their building is in a SFHA and that they have 45 days to purchase flood insurance. After 45 days, lenders have the statutory authority to force place flood insurance. If a borrower believes the flood zone determination was in error the borrower and the lender must jointly request a review from FEMA, with appropriate supporting technical information.

Increased Cost of Compliance

Increased Cost of Compliance (ICC) coverage provides for the payment of a claim for the cost to comply with State or community floodplain management laws or ordinances after a direct physical loss by flood. When a building covered by a Standard Flood Insurance Policy under the NFIP sustains a flood loss and the State or community declares the building to be substantially or repetitively damaged, ICC will help pay for the cost to elevate, floodproof, demolish, or relocate the structure up to a maximum of $15,000.

The Community Rating System (CRS)

The NFIP's Community Rating System (CRS) recognizes community floodplain management efforts that go beyond the minimal requirements of the NFIP by reducing flood insurance premiums for the community's property owners. Discounts to premiums range from 5% to 45%.

The CRS recognizes 18 floodplain management activities available for credit divided into four categories:

Public Information – This series credits programs that advise people about the flood hazard, flood insurance, and ways to reduce flood damage.

Mapping and Regulations – This series credits programs that provide increased protection to new developments. These activities include mapping areas not shown on the FIRM, preserving open space, enforcing higher regulatory standards, and managing stormwater.

Flood Damage Reduction – This series credits programs for areas in which existing development is at risk. Credit is provided for a comprehensive flood mitigation plan, relocating, elevating or retrofitting floodprone structures, and maintaining drainage systems.

Flood Preparedness Series – This series credits flood warning, levee maintenance and dam safety programs.

RESOURCES:

Tab 6 Insurance Rating Example
Tab 7 Flood Insurance Requirements in SFHA
Tab 8 The Community Rating System (CRS)
Tab 9 Standard Flood Hazard Determination Form (FEMA Form 81-93)
FEMA Publication #186 Mandatory Purchase of Flood Insurance Guidelines

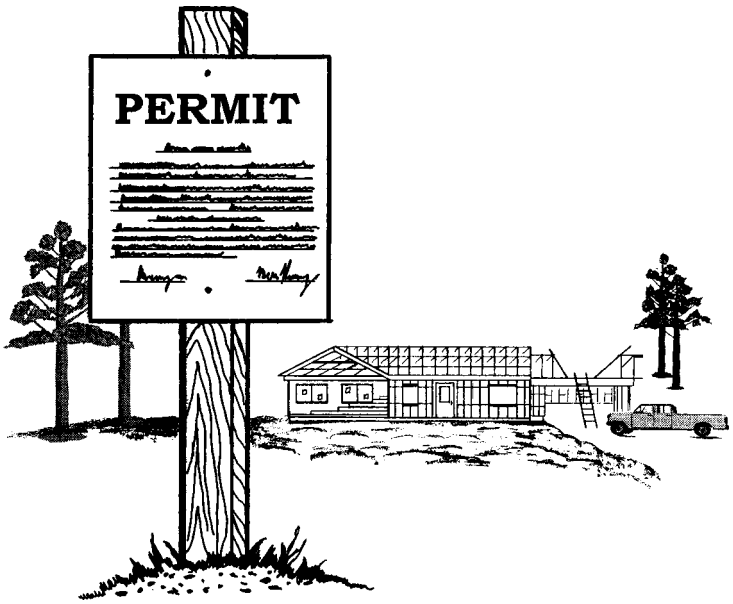
5. Floodplain Management at the Local Level

What are the Community's Responsibilities under the NFIP?

1. Require development permits for all proposed construction and other developments within the community's designated 100-year floodplain.
2. Review the permit to assure that sites are reasonably safe from flooding.
3. Review subdivision proposals to determine whether the project is safe from flooding and provides for adequate drainage.
4. Require residential structures to have the lowest floor (including basement) elevated at least to or above the Base Flood Elevation (BFE).
5. Require non-residential structures to have the first floor elevated or floodproofed one foot above the BFE.
6. Require manufactured homes to be elevated and anchored.
7. Require water supply systems designed to eliminate infiltration of flood waters.
8. Require new and replacement sanitary sewage systems be designed to minimize or eliminate infiltration of flood waters.
9. Assure flood carrying capacity of altered or relocated watercourses is maintained.
10. Maintain records of all development permits.
11. Verify/document 1st floor elevations of new or substantially improved structures.

The Development Permit

Communities participating in the NFIP must require development permits for all proposed developments within the designated 100-year floodplain. The permit, along with all development plans, must be submitted for approval to the appropriate local authority before beginning any development activity.



Q & A

Q: What information should a development permit contain?

A:
1. Applicant's name, address and telephone number
2. The location of the proposed development
3. A site map
4. Description of proposed activity
5. Elevation of ground site prior to development
6. Elevation to which lowest floor of the structure must be built
7. Elevation to which structure will be flood-proofed (non-residential only)
8. Base flood elevation data for subdivisions
9. Description of water course alterations
10. A space for approving or denying the permit
11. A space for signature and date

Q: When is a development permit required?

A: <u>All development within the regulatory floodplain requires a permit.</u>

Development includes:

- new construction or a substantially improved structure
- placing a manufactured (mobile) home
- mining, dredging, <u>filling</u>, grading or excavating
- roads, bridges and culverts
- altering or relocating stream channels
- travel trailers placed on site for more than 180 days
- storage of materials including gas or liquid storage tanks

EXAMPLE

Application for Permit
To Develop in a Floodplain Area

The undersigned hereby makes application for a permit to develop in a designated floodplain area. The work to be performed is described below and in attachments hereto. The undersigned agrees that all such work shall be done in accordance with the requirements of the ___(City/County)___ Floodplain Ordinance and with all other applicable local, State and Federal regulations. This application does not create liability on the part of the ___(City/County)___or any officer or employee thereof for any flood damage that results from reliance on this application or any administrative decision made lawfully thereunder.

Owner:_____ Builder:_____
Address:_____ Address:_____
_____ _____
Telephone:_____ Telephone:_____

Address of Property: _____
_____

A. Description of Work (Complete for All Work):

1. Proposed Development Description:
   - ☐ New Building
   - ☐ Improvement to Existing Building
   - ☐ Manufactured Home
   - ☐ Filling
   - ☐ Other _____

2. Size and location of proposed development (attach site plan):
   _____
   _____

3. Is the proposed development in a Special Flood Hazard Area (Zones A, AE, A1-A30, AH, or AO)?
   Yes ☐ No ☐

4. Per the floodplain map, what is the zone and panel number of the area of the proposed development?
   Zone _____Panel Number _____

5. Are other Federal, State or local permits obtained?
   Yes ☐ No ☐
   Type:_____

6. Is the proposed development in an identified floodway?
   Yes ☐ No ☐

7. If yes to #6, is a "No Rise Certification" with supporting data attached?
   Yes ☐ No ☐

EXAMPLE

B. Complete for New Structures and Building Sites :

1. Base Flood Elevation at the site: _____ feet NGVD
2. Required lowest floor elevation (including basement): _____ feet NGVD
3. Elevation to which all attendant utilities, including all heating and electrical equipment will be protected from flood damage: _____ feet NGVD

C. Complete for Alterations, Additions, or Improvements to Existing Structures :

1. What is the estimated market value of the existing structure? $_____
2. What is the cost of the proposed construction ? $_____
3. If the cost of the proposed construction equals or exceeds 50 percent of the market value of the structure, then the substantial improvement provisions shall apply.

D. Complete for Non-Residential Floodproofed Construction :

1. Type of floodproofing method: _____
2. The required floodproofing elevation is: _____ feet NGVD
3. Floodproofing certification by a registered engineer is attached: Yes ☐ No ☐

E. Complete for Subdivisions and Planned Unit Developments :

1. Will the subdivision or other development contain 50 lots or 5 acres? Yes ☐ No ☐
2. If yes, does the plat or proposal clearly identify base flood elevations? Yes ☐ No ☐
3. Are the 100 Year Floodplain and Floodway delineated on the site plan? Yes ☐ No ☐

ADMINISTRATIVE

1. Permit **approved** ☐ Permit **denied** ☐ (Statement attached)
2. Elevation Certificate attached: Yes ☐ No ☐
3. As-Built lowest floor elevation: _____ feet NGVD
4. Work inspected by: _____
5. Local Administrator Signature: _____ Date_____
6. Applicant's Signature: _____ Date_____

CONDITIONS:_____
_____
_____
_____
_____
_____
_____

Reviewing the Development Permit Application

STEP 1 **Locate the development site on the community's floodplain map.**

If the project site is obviously outside the shaded A-Zone or V-Zone, then floodplain regulations do not apply. If the project site *is* in a shaded A-Zone or V-Zone (or is a borderline question), proceed to Step 2.

STEP 2 **Ensure project meets the NFIP/local ordinance definition of "development."**

See the previous page for the type of activity that is considered development. As a general rule of thumb, anything that alters the natural topography of the floodplain needs a permit review. Please be advised that development does not include: maintenance of existing buildings and facilities; resurfacing of roads; gardening, plowing and similar agricultural practices that do not involve filling, grading or construction of levees.

STEP 3 **Have the owner/developer fill out a local Building Permit Application.**

A location or plat map of the site should be attached to every application form. Plans of the proposed development should also be attached showing existing and proposed conditions including all appropriate dimensions and elevations. Check to see if the site is located in the regulatory *floodway* by measuring the floodway width on the Floodway Map and comparing this distance to the proposed project's actual ground location. Development cannot occur in any floodway without a detailed analysis from a licensed engineer and/or hydrologist proving that the development will cause *no-rise* in the base flood elevation.

STEP 4 **Check to see if the project includes a new building or a substantial improvement of an existing building.**

A "building" is a structure that is principally above ground and is enclosed by walls and a roof including manufactured homes and prefabricated buildings. The term also includes recreational vehicles and travel trailers to be installed on site for more than 180 days.

When a Pre-FIRM building is proposed to be remodeled, renovated, rehabilitated, added to or in anyway improved, the proposed modifications must be evaluated for "substantial improvement". If the total costs of the improvement are 50 percent or more of the building value, the building must be elevated above the BFE. If the project includes a new "building" or "substantial improvement," go to Step 5.

STEP 5 **Obtain the Base Flood Elevation at the project site:**

1. From the Flood Insurance Rate Map (FIRM), or
2. From the profiles found in the Flood Insurance Study (FIS).
3. If neither 1 nor 2 exist, from any other Federal, State or local source - commonly called "best available data".
4. If there is no base flood elevation (BFE) data available, you may want to require the applicant to determine the BFE.

STEP 6 **Review the construction plans to make sure that the lowest floor of the building is built to, or above, the base flood elevation (BFE).**

Some states and communities require the lowest floor to be built one or two feet above the BFE. Check your local floodplain ordinance. Building protection can be done by one of three methods:

1. ***Elevate on fill.*** Check the plans to ensure that: the top of the fill is at or above the BFE; the fill is protected from erosion and scour; the fill is properly compacted; and, the fill does not cause drainage or flow on to neighboring properties.

2. ***Elevate on piers, posts, columns or walls***. Check the plans to ensure that materials used below the lowest floor are resistant to flood damage. Check that all electrical, heating, ventilating, plumbing, air conditioning equipment, and utility meters are located above the BFE. Ensure all water and sewer pipes, electrical and telephone lines located below the BFE are waterproofed. If walls are used they must have permanent openings no more than one foot above grade (openings of at least one square inch for every square foot of lower area subject to flooding).

3. ***Floodproofing for non-residential buildings only***: The plans for a floodproofed building must be prepared by a registered engineer who must sign and seal a floodproofing certificate. The certified floodproofed elevation must be at least one foot above BFE.

Once you are assured that the building complies with all floodplain management measures, issue the permit. Make sure that the plans and any other assurances are made part of the application and maintained in your records. Also, keep in mind that permits may be required from state and federal agencies as well. Proceed to Step 7.

STEP 7 **Make site inspections to ensure that the project is built according to the permitted plans.** Document the as-built lowest floor elevations on the elevation certificate.

STEP 8 **Keep all pertinent records.**

Retain all records, even for completed projects and denied permits.

Duties of the Local Floodplain Administrator

Reviews and evaluates development permit applications

- ✓ Makes permit applications available to prospective developers
- ✓ Checks applications for completeness
- ✓ Checks development locations on floodplain maps
- ✓ Determines if development affects floodway
- ✓ Determines BFE for site
- ✓ Establishes first floor elevations
- ✓ Requires additional Federal/State/local permits
- ✓ Determines if watercourse alterations will reduce carrying capacity
- ✓ Uses best available data when FEMA has not provided BFEs

Issues Permits

- ✓ Assures application meets NFIP criteria
- ✓ Conditions permits for lowest floor elevation
- ✓ Conditions permits for construction standards

Denies permits

- ✓ If the application does not meet NFIP criteria

Inspects Development In-Progress

- ✓ Field checks development locations
- ✓ Field checks 1st floor elevation before framing inspection
- ✓ Ensures that construction occurs in conformance with approved plans

Requires Elevation Certificates

- ✓ Ensures that the as-built elevation of the lowest floor is at or above BFE

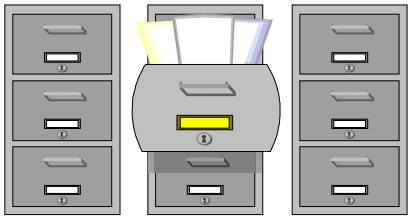
Maintains Records of Floodplain Development

- ✓ Records number of floodplain development permits
- ✓ Retains copies of elevation certificates and permits

Submits Biennial Reports

- ✓ Completes FEMA report form every other year

Record Keeping



<u>The following records must be kept on file and open for public inspection</u>:

1. A complete and up-to-date copy of the floodplain ordinance

2. The current flood map (FIRM, Floodway, and FIS)

3. A copy of the NFIP regulations

4. Certification of lowest floor elevations (including basement) of all new and substantially improved structures located in the designated floodplain

5. Certification of the elevation to which non-residential structures have been floodproofed

6. A project file for each development permit issued. The project file should contain the following:
   (a) a copy of the permit application
   (b) a copy of the permit review checklist
   (c) a copy of all the engineering data (plans, specifications, hydraulic and hydrologic analyses) used to document a development's compliance with the NFIP floodway (no rise) and encroachment standards
   (d) a copy of the engineering analyses submitted for a watercourse alteration project along with correspondence to neighboring communities and the State Water Resources Department
   (e) copies of all correspondence relating to the project
   (f) any variance or appeals proceedings
   (g) documentation of the inspections of the development
   (h) base flood elevation data for subdivisions of 5 acres or 50 lots
   (i) elevation certificates for documenting lowest floor elevations, or floodproofing certificates
   (j) a copy of the certificate of occupancy

7. A file should be kept for the Biennial Reports that are submitted to FEMA. You may wish to keep the following information in this file also: (1) copies of previous years' annual and biennial reports; (2) a running total of permits and/or variances granted in the flood hazard area; (3) maps of new annexations or other boundary changes; and, (4) records of any man-made changes that effect flooding.

The Elevation Certificate

What is an Elevation Certificate?

One of the requirements for participation in the National Flood Insurance Program (NFIP) is that communities "obtain the elevation of the lowest floor (including basement) of all new and substantially improved structures, and maintain a record of all such information". The Elevation Certificate form published by FEMA, is a way for communities to comply with this requirement.

What is an Elevation Certificate used for?

- Recording the elevation of the lowest floor of all newly constructed buildings located in the floodplain.
- Determining the proper rate when purchasing flood insurance.
- Supporting a request for a Letter of Map Amendment (LOMA) or a Letter of Map Revision (LOMR).

FEMA's Elevation Certificate form…

- Does not waive the requirement to purchase flood insurance. Only a LOMA or a LOMR can amend the FIRM and remove the Federal requirement for a lending institution to require the purchase of flood insurance.
- Is used as the basis for receiving a LOMA/LOMR, which can waive the flood insurance requirement.
- Is required for use by all NFIP participating communities.
- Needs to be completed, stamped and signed by licensed engineer or surveyor (for Zones AE, A1-A30, AH, VE, V1-V30)
- For zones without BFEs (AO, A), a building official or property owner may complete the certificate.

RESOURCES:

Tab 10 The Elevation Certificate
Tab 11 The Floodproofing Certificate (non-residential only)
Tab 12 Determining Elevations in the Field
Tab 13 Flood Hazard Area Construction Options

6. NFIP Floodplain Development Standards

Please note that the following floodplain development standards are the minimum required for a community to participate and maintain eligibility in the NFIP. Many local communities and States have adopted higher floodplain regulatory standards. Always consult your local flood damage prevention ordinance for your particular community's floodplain development requirements.

Floodway Standards

Floodways: No development is permitted in the floodway, *unless* a licensed engineer can certify through a scientific analysis that the development will cause no-rise to the BFE(s). This should include two studies: a step-backwater analysis and a conveyance compensation computation. (See Tab 14)

Please note that the "no rise" standard is to be interpreted exactly and strictly; that is, no-rise above the BFE will be permitted. Communities are encouraged to secure the services of an independent, third party, engineer to review the no-rise analysis.

General Standards

Anchoring: All structures are to be anchored to prevent hydrodynamic and hydrostatic forces from moving them from their foundations.

Construction Materials and Methods: The area below the lowest floor must be unfinished and remain free of water damage. This requires that new buildings and substantial improvements must be constructed with materials and by methods to resist or minimize flood damage.

Utilities: Utilities servicing flood prone structures must be floodproofed.

- Control panels must be located above the BFE.
- Heating, air conditioning, and ventilation equipment placed above BFE.
- Water supply systems and sanitary sewer systems designed or located to minimize or eliminate infiltration of floodwaters.

Subdivisions: All subdivisions must be designed to minimize flood damage and to not increase flood levels. Developer must provide BFE data (if unknown) for all subdivisions of 50 lots or 5 acres, whichever is less.

- Flood levels should not increase when subdivisions are developed
- Recommend building sites be at least two feet above streets
- Lowest floor of all structures must be above BFE
- Protect utilities
- Ensure adequate drainage
- Streets should drain rapidly
- Require evacuation plan

Encroachments: Proposed developments cumulatively may not increase base flood heights more that one-foot anywhere in the identified floodplain. (Applies only to floodplains with BFEs but without identified floodways)

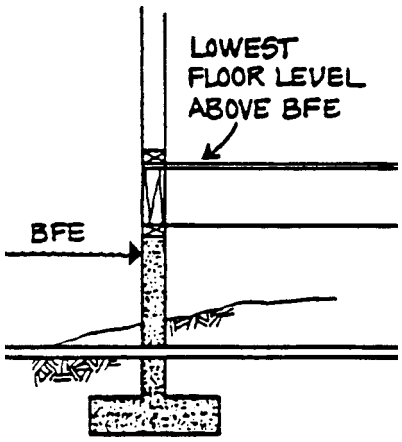
Watercourse Alterations: All watercourse alterations or modifications must not reduce the carrying capacity of the stream or increase BFEs.

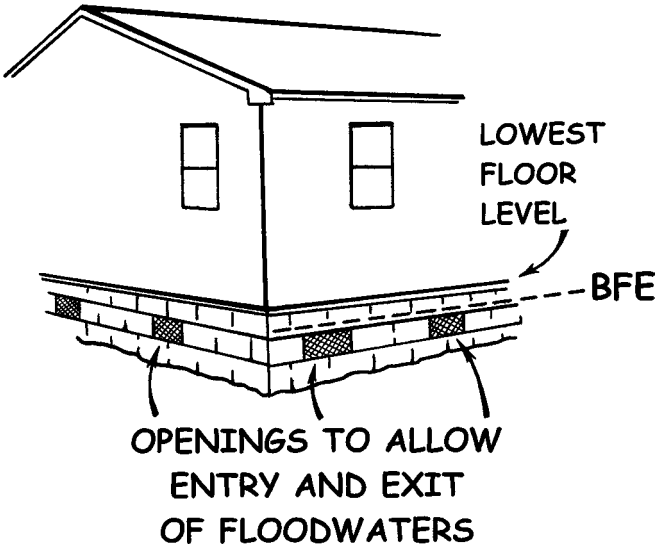
- Applicant must provide a thorough description of activity
- Compare existing channel capacity with proposed capacity and assess changes
- Alteration or modification must maintain carrying capacity of the watercourse
- Notify State Coordinating Office and adjacent communities of proposal
- Notify FEMA of any significant changes to watercourse
- Floodway regulations apply for alterations within a designated floodway

Specific Standards

Residential Structures:

Residential structures must have the lowest floor including basement elevated at least to or above the BFE. This elevation requirement can be accomplished by any of the following three (3) methods:



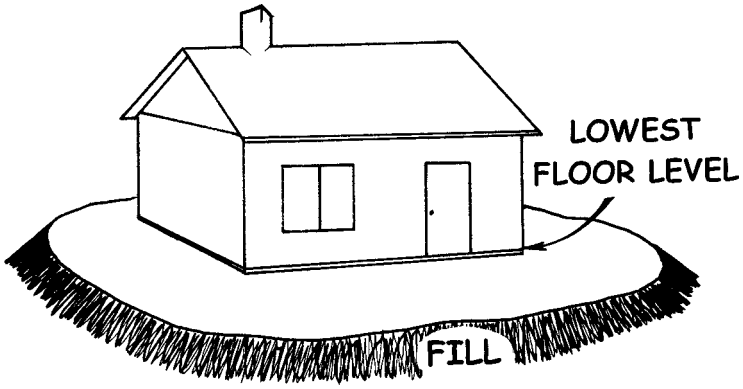


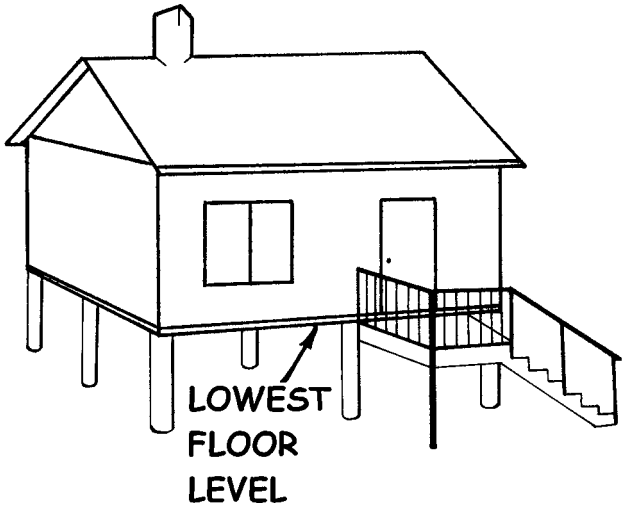
1. Foundation Stem Walls:

The crawlspace must not be below grade. It must have as a minimum two permanent openings no more than one foot above grade. The total area of the openings must be no less than 1 square inch for every square foot of enclosed space. This helps to relieve hydrostatic pressure on the foundation during a flood. Any cover placed over the openings must be able to open automatically during flood flows without human intervention. Screens are acceptable if they permit entry and exit of floodwater.

2. Fill:

A poured slab placed over compacted fill can also be used to elevate the lowest floor of a structure above the BFE. Please note that when a building site is filled, it is still in the floodplain and no basements are permitted.





3. Piers, Piles and Posts:

This method is commonly used to avoid large fills and when flood heights are extreme. The supporting members must be designed to resist hydrostatic and hydrodynamic forces.

Fully enclosed areas below the BFE can only be used for parking, access and limited storage. In addition, the following conditions must be met for any enclosed area below the BFE:

b) Service equipment (e.g., furnaces, water heaters, washers/dryers, etc.) are NOT permitted below the BFE.
c) All walls, floors, and ceiling materials located below the BFE must be unfinished and constructed of materials resistant to flood damage.
d) The walls of any enclosed area below the BFE must be designed by a registered professional engineer or architect in a manner to prevent lateral movement, collapse or flotation of the structure. There must be at least two openings on each wall and the bottom of all openings must be no higher than one foot above grade. (See Technical Bulletin, Tab 16)

Non-residential Structures

Must have the lowest floor including basement elevated to or above the BFE, or floodproofed at least one foot above BFE. If floodproofed, structures must be dry-floodproofed, which means keeping the water out. Non-residential (commercial) structures, together with attendant utility and sanitary facilities, are designed so that the structure is watertight below the base flood level. The walls are impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy. Additionally, the structure must be designed to:

- prevent seepage, collapse or cracking of basement walls
- prevent buckling of basement floors
- prevent back-up of water from sewer lines
- have all openings located one foot above BFE
- all protective features must operate automatically without human intervention

Note: Dry floodproofing measures must be certified by a licensed engineer and only apply to non-residential structures.

Additional Permits

Ensure applicants obtain any additional State or Federal permits prior to issuing your local floodplain development permits.

Basements and Crawlspaces

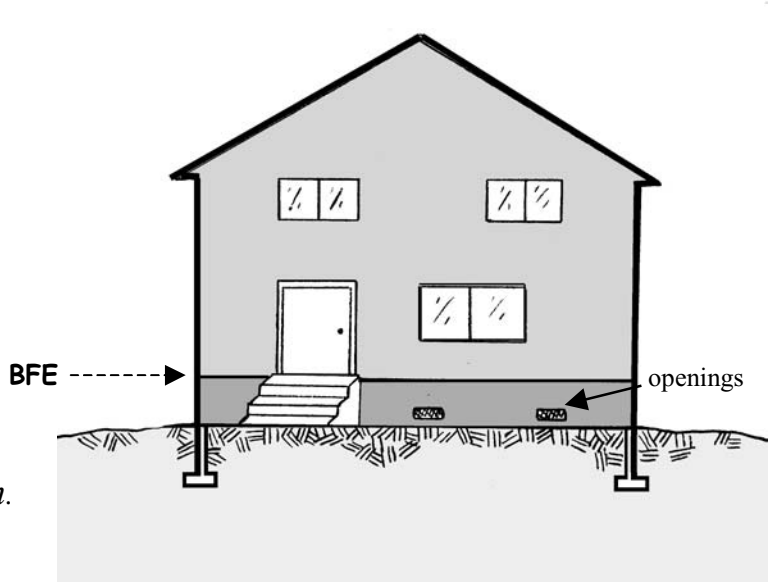
Any structure in a regulatory floodplain having its lowest level (either finished or unfinished) below ground level (subgrade) on all four sides is not permissible under local flood damage prevention ordinance requirements and the regulations governing the NFIP.

Therefore, neither basements nor excavated (subgrade) crawlspaces can be constructed in the regulatory floodplain.

Crawlspace Examples

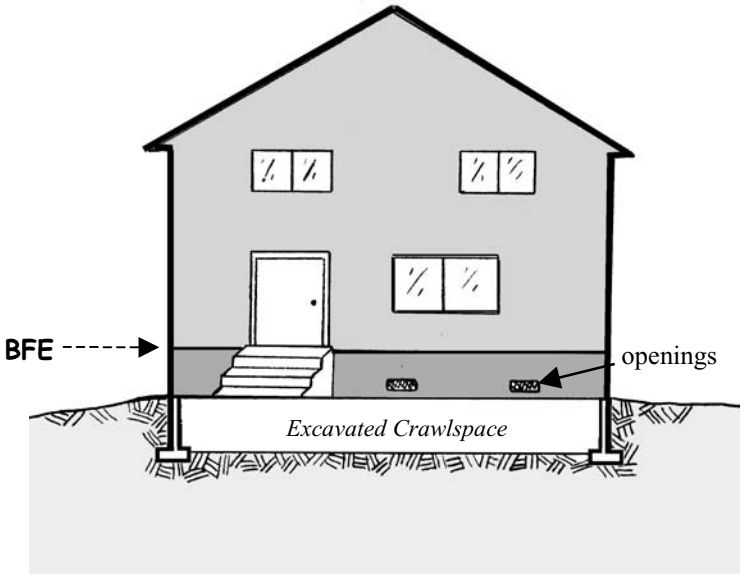
Compliant

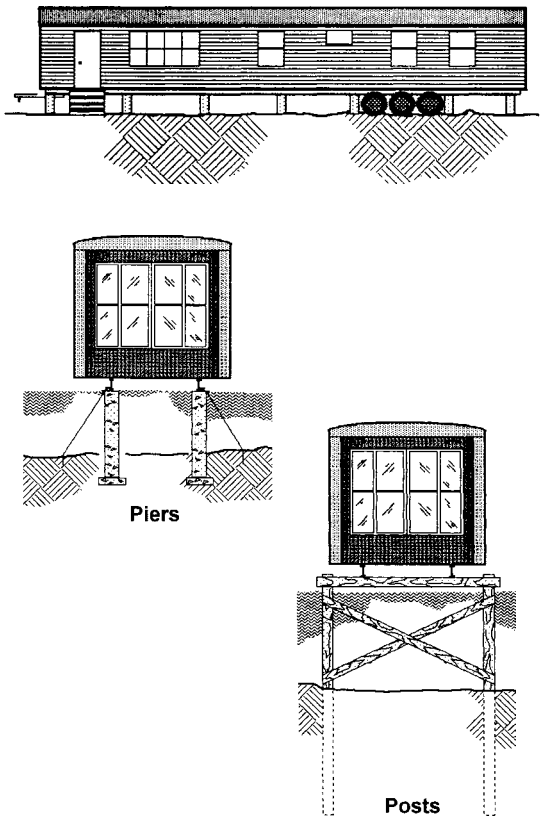
At-Grade crawlspace
The interior and exterior grade of the crawlspace are at the same level.
This is proper construction.



Non-compliant

Excavated crawlspace.
The crawlspace has been excavated to footers, The bottom level of the crawlspace is below grade on four sides.
This is not permissible.





Manufactured (Mobile) Homes:

✓ Must be elevated to or above the BFE.

✓ Mobile homes on single lots must be elevated on permanent foundations to or above the base flood elevation (BFE).

✓ Homes in existing mobile home parks or subdivisions must be elevated on a permanent foundation and (1) have either its chassis elevated on foundations at least 36 inches above grade or, (2) have its lowest floor at or above BFE.

✓ For a mobile home park site or subdivision that has received substantial damage (over 50%), elevation must be to or above BFE.

✓ All mobile homes in flood hazard areas must be anchored to a permanent foundation.

Recreational Vehicles (RVs):

RVs must be on site for less than 180 consecutive days, or be fully licensed and ready for highway use, or be elevated to or above the BFE and meet manufactured home anchoring standards.

Substantial Improvement: A Substantial Improvement is defined by NFIP regulations as: Any repair, reconstruction, or improvement of a structure the cost of which equals or exceeds 50 percent of the market value of the structure either, (a) before the improvement or repair started, or (b) if the structure has been damaged and is being restored, before the damage occurred.

Any substantially improved structure must be brought into compliance with the NFIP requirements for new construction; in other words, it must be elevated (or floodproofed if it is a non-residential structure) to the flood protection elevation.

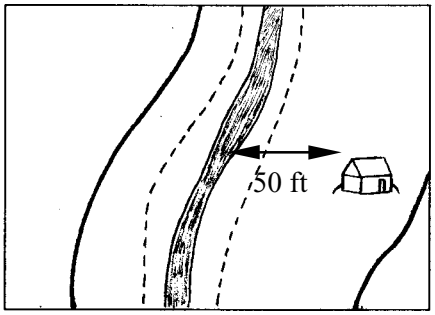
When a structure is substantially improved, it is considered a new "post-FIRM" structure, and actuarial flood insurance rates would apply based on the lowest floor elevation of the structure.

Substantial Damage: Substantially damaged buildings fall under the substantial improvement criteria. Substantial damage means damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition equals or exceeds 50 percent of the market value of the structure before the damage occurred.

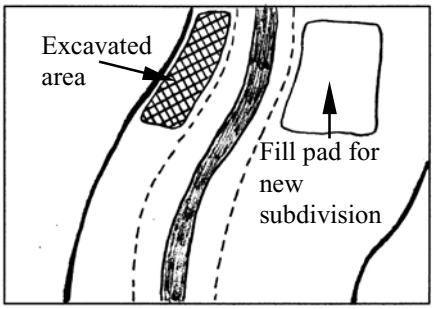
Higher Regulatory Standards

In order to better meet their floodplain management goals, many communities have adopted flood damage prevention ordinances that go beyond the minimum requirements of the NFIP. Some of the more common higher regulatory floodplain management provisions adopted by communities include:

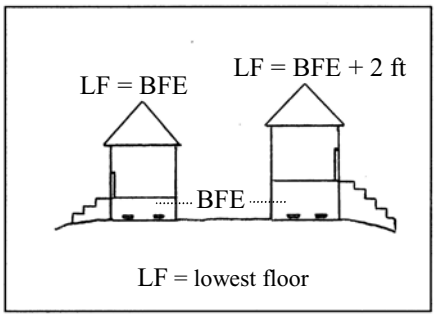
Setback requirements - With a setback, structures are required to be sited back away from the top of the bank of a stream or river, or setback from the floodway line a certain distance (eg, 50 or 100 feet). Setbacks have several advantages: (1) they provide an added margin of safety by keeping structures away from higher velocity flood forces closer to the channel; (2) they reduce flood losses caused by stream bank failure (erosion damage) when stream channels naturally migrate; and, (3) they can provide a riparian buffer along the stream channel to protect fish and wildlife habitats.



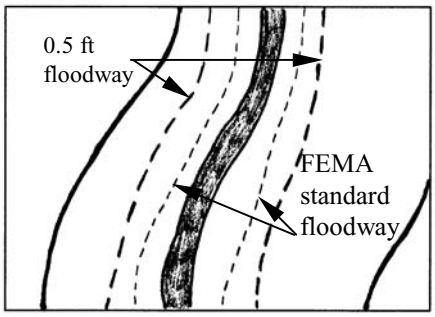
Compensatory Storage Requirements - Sometimes referred to as "cut-and-fill", this code requires developers to compensate for the loss of conveyance (storage) caused by filling in the floodplain fringe by removing an equal amount of material in the floodplain near the proposed development. This provision helps to maintain flood storage and ensure that floodwaters will not be displaced onto someone else's property as the result of a floodplain fill.



Freeboard Requirements - Many communities require the lowest floor of structures to be elevated one, two or more feet above the BFE. Although building *to* the BFE is the minimum FEMA standard, there are several reasons why communities adopt a freeboard requirement: (1) larger floods than the base flood do occur; (2) building only to the BFE may not protect floor joists and insulation since they may be below BFE; (3) the BFE is based on current conditions, and flood heights usually increase, especially in urban areas, as development increases; (4) the higher the lowest floor above the BFE, the cheaper the flood insurance rates; and, (5) provides peace of mind to property owner.



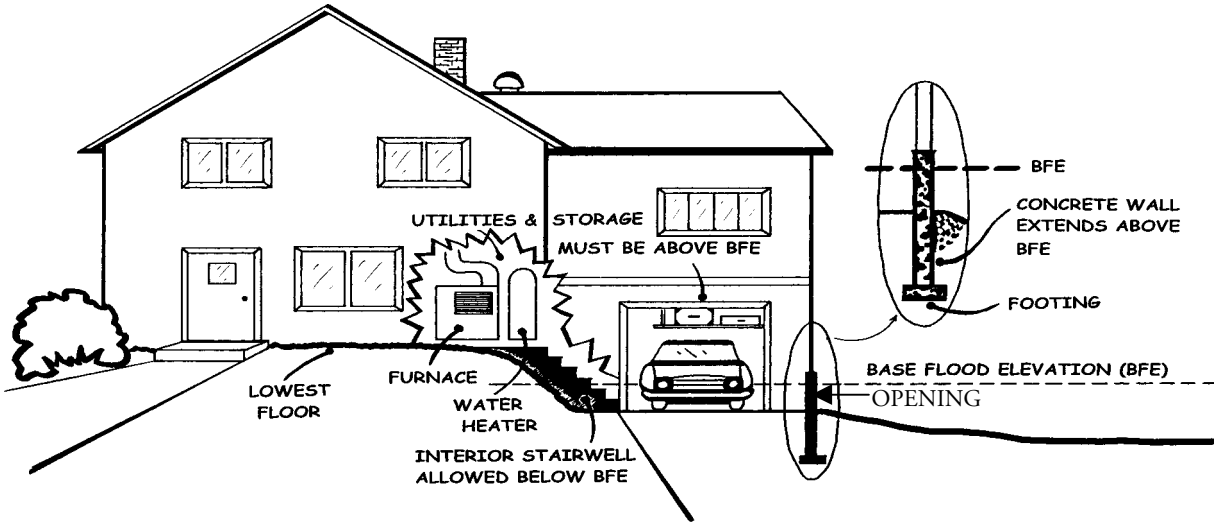
Higher Regulatory Floodway - Some communities use a 0.1 foot or 0.5 foot surcharge (instead of the normal FEMA standard of a 1 foot surcharge) as the basis for computing the regulatory floodway on their FIRMs. This usually results in a wider regulatory floodway.



Unnumbered A-Zones

In approximate study areas or unnumbered A-Zones (flood zones where the BFEs have not been determined), structures can be built with the lowest floor at grade—again no basements are allowed. However, it is recommended that the lowest floor be elevated at least two (2) feet above the highest adjacent grade. This is because flood insurance premiums are significantly less for structures built two feet above grade than for structures built at existing ground level. Remember that BFEs must be generated for all subdivisions of 50 lots or 5 acres, whichever is less.

Residence with Allowable Uses below the BFE



RESOURCES:

See Tab 14 Floodway "No Rise" Analysis Guidelines
See Tab 15 Substantial Damage Determination Packet
See Tab 16 Technical Bulletins
See Tab 21 Higher Regulatory Standards
See FEMA Publication #311 "Substantial Damage Estimator"
See FEMA Publication #85 "Manufactured Home Installation in Flood Hazard Areas"
See FEMA Publication #54 "Elevated Residential Structures"

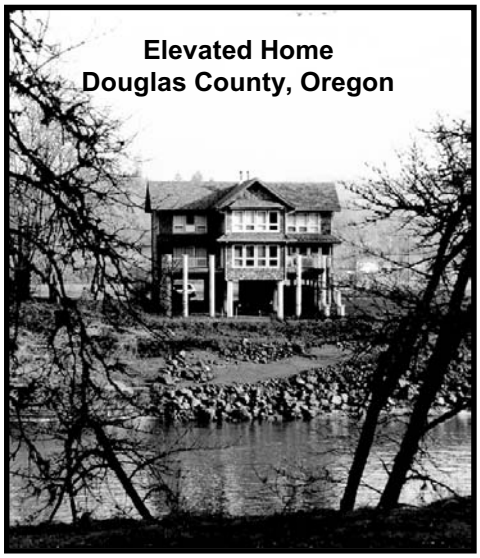
7. Flood Hazard Mitigation

Flooding is a natural event. Flood damages only occur when man interferes with the natural flooding process by altering the watercourse, developing areas in the upper watershed, and/or building inappropriately within the floodplain. Approximately 90 percent of all federal disaster assistance payments to local governments and private citizens are a result of flood damages.

Flooding in the Northwest can be separated into several types including: overbank riverine floods, flash floods, alluvial fan floods, ice-jam floods, local drainage floods, groundwater floods, dam-break floods, coastal flooding, including storm surges and tsunamis, and fluctuating lake level floods. The traditional solution to flood problems has been to construct structural protection works such as dams, diversions, levees, and floodwalls. Despite tremendous expenditures for these structural projects, flood losses have continued to increase year after year. Given this, communities have begun to see the solution to avoiding flood damages lies not in keeping the water away from people, but rather in keeping people away from the water.

Building Protection Measures

Acquisition: In some instances it is more cost-effective for governments to purchase repetitively flooded houses and demolish or move them, than it is to constantly pay out disaster assistance and flood insurance claims. Once demolished or moved, the now cleared land is deed restricted as open-space and may be converted to a park, or reverted back to its natural state. Since 1993, FEMA has funded the acquisition of some 20,000 homes and businesses located in frequently flooded areas throughout the country.

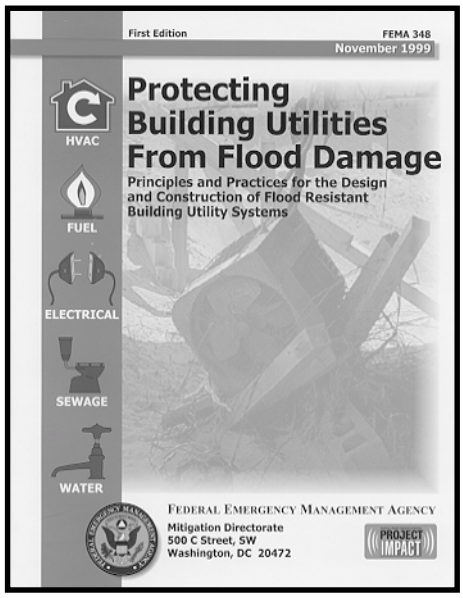

Elevated Home
Douglas County, Oregon

Relocation: Similar to acquisition, relocation involves physically moving a house from the floodplain and placing it out of harm's way.

Elevation: Next to acquisition or relocation, raising an existing structure above the flood level is the next best solution to protecting a structure from flood damage. Structures can be elevated on posts or piles where the water can flow under the building, causing little or no damage to the structure and its contents.

Dry-floodproofing: A dry floodproofed building is sealed against floodwaters. All areas located below the flood level are made watertight. Openings like doors, vents, and sewer lines are either closed permanently, or constructed with automatically closing valves/vents or removable shields.

Wet-floodproofing: With wet floodproofing, floodwaters are intentionally allowed into the building to minimize water pressure on a structure's foundation. Damage is avoided by taking simple measures like moving furniture and appliances to areas above the flood level, or by elevating vulnerable equipment, electrical controls, furnaces and water heaters.



FEMA Publication 348

Sewer-backup Protection: Overloaded sewers can be prevented from backing up into a home or business by using a variety of plumbing alterations such as; a floor drain plug, or backflow valve.

Open Space Uses

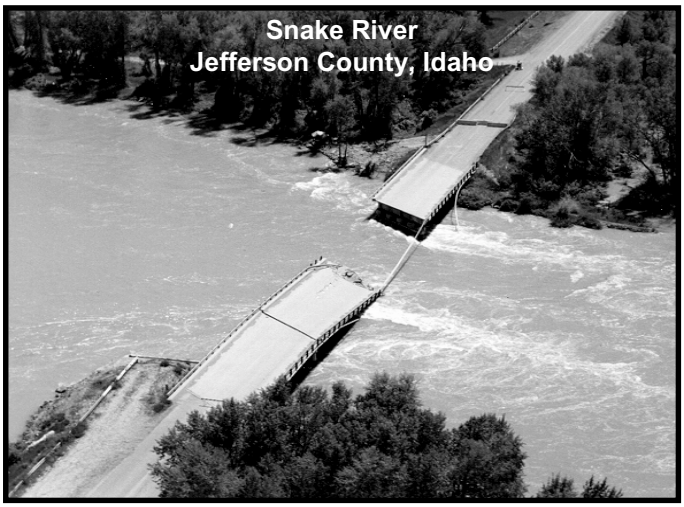
Land Acquisition: The best way to prevent flood damage is to keep the floodplain free of development. Local governments or community groups can purchase flood-prone lands and set the areas aside for open-space uses such as recreational or wildlife habitat.

Purchase Easements/Development Rights: Easements are another method of keeping development out of sensitive flood areas. With an easement, a private owner is free to use the property, but agrees not to build on the flood-prone side of their property that has been set aside in the easement. In exchange, a payment is either made to the owner, or property taxes are lowered. Many communities have purchased development rights to agricultural areas located in the floodplain in sprawling near-urban areas. In this way, farmers and ranchers can continue to produce their product while precluding the most flood-prone land from being subdivided and developed.

Planning

Comprehensive Land Use Plans: These plans specify where development should and should not occur in a community. Through these plans, use of the land can be tailored to take into account the natural hazard threat. For instance, flood-prone areas can be reserved for parks, golf courses, backyards, or natural areas. Though these plans may have limited authority, they often drive other local measures such as zoning and subdivision ordinances.

Capital Improvement Plans: These plans detail where major public expenditures are to be made over next 5 to 20 years and include funding decisions for such things as acquiring parkland, and improving roads, bridges, and utilities. These publicly funded projects should be geared, first and foremost, to avoiding the natural hazard threat. If the hazard cannot be totally avoided, then projects should be constructed in such a way as to minimize the damage that will occur when disaster strikes.



Hazard Mitigation Plans: Many communities have developed a stand-alone hazard mitigation plan that identifies the hazard threat and then tailors a range of non-structural, structural, and land-use regulatory activities to remove or significantly decrease the damage and economic loss caused by future flooding.

Regulatory / Local Ordinance Measures

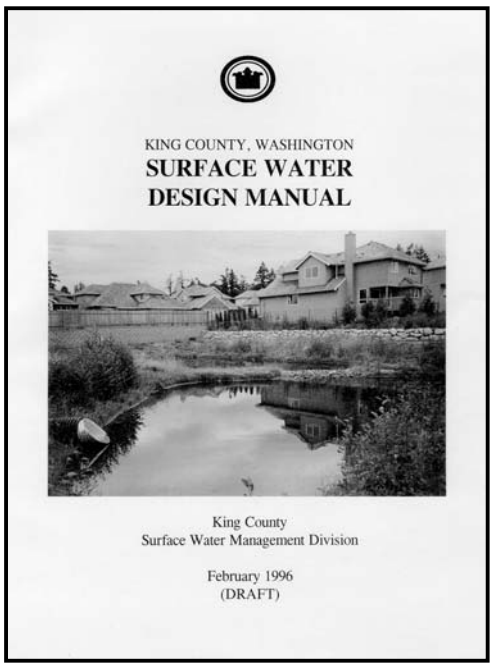
Zoning Ordinance: In a zoning ordinance, floodplains can be designated as one or more zoning districts in which development is prohibited or allowed only if it is constructed to minimize flood damage (per the requirements of the National Flood Insurance Program and local Floodplain Management Ordinances). Some types of flood districts are dedicated for recreation, public use, conservation, or cluster developments that keep houses out of floodplains. Often, the flood zone designation takes the form of an overlay or combining zone.

Subdivision Ordinances: These regulations determine how land will be broken down into individual lots. They also state how homes should be sited in relation to the floodplain (preferably outside), and they set construction and location standards for the infrastructure that will service the subdivision.

Building Codes: Flood protection standards should be incorporated into the local building code. At a minimum they should ensure that the lowest floor of the structure is built above the base flood elevation (BFE), and that the foundation will withstand flood forces. Certain minimum standards are in the Uniform Building Code, and this code is either required or recommended in all northwest states.

Floodplain Management Ordinances: Most communities participate in the National Flood Insurance Program (NFIP) and therefore have adopted Floodplain Management Ordinances. However, many communities go beyond the minimum requirements of the NFIP and adopt higher regulatory standards in their flood ordinances (e.g., more restrictive floodways, freeboard above the BFE, riparian setbacks, etc.).

Stormwater Management Regulations: These require developers to build on-site detention basins to handle the increased runoff caused by new developments with large impervious areas (subdivisions, shopping malls, etc.). Stormwater is not allowed to leave the property at a rate higher than its pre-developed condition. In addition, stormwater regulations can address the problem of sedimentation, which can fill in channels and lakes, reducing their ability to carry or store floodwaters. One way to keep sediment from entering nearby streams and rivers is to require sediment traps at new construction sites.



King County's Comprehensive Surface Water Design Manual

Post-Disaster Recovery Ordinance: This ordinance establishes a recovery organization that authorizes a variety of pre- and post-event planning and regulatory powers and procedures related to disaster recovery and reconstruction.

Wetlands Protection: Wetlands can store large amounts of floodwaters, slow and reduce downstream flows and protect shorelines from erosion. Efforts to preserve wetlands, especially smaller ones not covered by a Corps 404 (wetlands) permit, can aid a community's efforts in decreasing flood damages. Some states, like Washington, have created model local wetlands ordinances.

Community Rating System:

Community Rating System: The National Flood Insurance Program (NFIP) Community Rating System (CRS) recognizes community floodplain management efforts that go beyond the minimum requirements of the NFIP by reducing flood insurance premiums for the community's property owners. Discounts to premiums range from 5% to 45%. To receive credit in the CRS, a community can choose to undertake some or all of the 18 floodplain management and public information activities that comprise the CRS. Many of the flood mitigation activities outlined in this section are eligible for CRS credit.

Other Ideas

Floodplain Mapping: FEMA has mapped floodplain areas in over 12,000 communities across the country. However, many of these maps are over a decade old. In addition, many areas, especially smaller watersheds, have never been mapped. In response to this, many local governments have conducted their own flood studies, and based on this data, regulate development accordingly.

Drainage System Maintenance: Regular maintenance is needed to clean out channels and detention basins blocked by debris. A proper drainage system maintenance plan should do more than remove detritus from ditches. It should also include regulations preventing dumping, filling or altering of a watercourse.

Comprehensive Watershed Tax: In order to raise funds to carry out flood mitigation projects, some communities have passed levies to tax property owners in a particular watershed. The amount of taxes can be based on the sub-watershed where one lives, the value of one's property, or the amount of impervious area on each parcel.

Real Estate Disclosure: Often homebuyers are already committed to purchasing a property before their lending institution informs them, under Federal law, that the home they are interested in is in the floodplain. Real estate listings stating whether a property is located in a regulatory floodplain and whether a structure has suffered past flooding or sewer backup problems could help the consumer make a better-informed decision.

Community Outreach: Some communities have provided low-interest loans, tax breaks or grants to individual property owners to flood retrofit their homes. Also, local governments can inform citizens of the flood threat through a myriad of means, and can also provide technical assistance on such things as improving local drainage and floodproofing options.

Flood Warning: A flood threat recognition system provides early warning of an impending flood. The warning can be disseminated via sirens, a mobile public address system, radio or television. However, a flood warning system does not provide long-term damage reduction otherwise provided by a comprehensive flood mitigation program.

Fish Enhancement Projects: Due to declining fishery stocks in the Northwest, numerous structures to enhance fish habitat are being placed in streams and rivers. These various barbs and drop structures should be designed so that they do not increase flood heights.

Hazardous Materials: Petroleum products, chemicals and other toxic substances located in the floodplain should be identified, and where possible, relocated out of the floodplain. At a minimum, drums and gas and liquid storage tanks containing toxic substances should be elevated and properly anchored – these items can become floating debris that may strike buildings or plug bridge openings causing increased flood heights and damages.

Dam Failure: Several thousand regulated dams nationwide are categorized as high-hazard, that is, their failure will likely cause significant loss of life and property. Many dams have been built with improper spillways, and downstream development is increasing. To avoid failure, dams should be identified and then inspected on a regular basis. Spillway capacities should be increased if deemed necessary.

Structural Measures: There are various types of structural measures that can be constructed to protect properties, including levees, floodwalls, reservoirs, as well as other activities such as limited dredging and channel modifications. However, history has proven that reliance on structural flood control measures can create a false sense of security, which often leads to even greater destruction when these structural projects fail during a large flood event. However, localized structural measures are often necessary to protect existing critical facilities that are water dependent, like water and wastewater treatment plants.

RESOURCES:

Tab 17 Flood Protection Measures for the Homeowner
Tab 18 Model Flood Mitigation Plan
Tab 21 Higher Regulatory Standards
FEMA Publication #102 Design Guidelines for Flood Damage Reduction
FEMA Publication #114 Retrofitting Flood-prone Residential Structures
FEMA Publication #348 Protecting Building Utilities From Flood Damage
FEMA Publication: Subdivision Design in Flood Hazard Areas

8. Glossary

Anchoring: Special connections made to ensure that a building will not float or be pushed off its foundation during a flood.

Appeal: A request to higher authority such as a Board of Appeals or a City Council to overrule a permit denial because the applicant claims that the ordinance has been incorrectly interpreted.

BFE (Base Flood Elevation): The elevation of the crest of the base flood.

Base Flood: The flood having a one percent chance of being equaled or exceeded in any given year (often called the 100-year or one percent chance flood).

Basement: Any area of a building having its floor below ground level on all sides.

Best Available Data: Most recent hydraulic and hydrologic information that show the 100-year flood elevations and floodplain boundaries in a particular area.

Building: A structure that is principally above ground and enclosed by walls and a roof. Includes manufactured homes, prefabricated buildings, plus recreational vehicles or travel trailers installed on a site for more than 180 days.

Floodplain Manager: Individual who administers and enforces a community's floodplain ordinance. Depending on the local ordinance, this person could be a city engineer, building inspector, mayor, clerk, zoning administrator, or other official.

Coastal High Hazard Area: An area of special flood hazard extending from offshore to the inland limit of a primary frontal dune along an open coast and any other area subject to high velocity wave action from storms or seismic sources. The area is designated on the FIRM as Zone V1-V30, VE or V.

CFR: Code of Federal Regulations. A master coding system to identify the federal agency regulations that have been published in the Federal Register. 44 CFR includes all the regulations published by the Federal Emergency Management Agency.

Cross section: Survey information that records the dimensions of a channel and floodplain at right angles to flow.

CRS (Community Rating System): A program of the FIA where communities who regulate floodplain areas above and beyond minimum NFIP requirements are rewarded for their efforts through reduced flood insurance premiums for the citizens of that community.

Datum: Reference point used to insure all elevation records are properly related. Many communities had their own datum developed before there was a national standard. All flood insurance studies currently use National Geodetic Vertical Datum (NGVD).

Development: Any man-made change to the ground that may affect flood flows. Development includes buildings, filling, channel changes, dredging, grading, excavating and storage of materials

Discharge: The amount of water that passes a point. Discharge is usually measured in cubic feet per second. For flood studies the peak flood discharge is the greatest amount of water that will pass a point at the crest of the flood.

Elevation Certificate: A form supplied by the Federal Emergency Management Agency (FEMA) and used to document the lowest floor elevation of a building.

FEMA: Federal Emergency Management Agency. Administers the NFIP.

FHBM:
See: "Flood Hazard Boundary Map"

FIA: Federal Insurance Administration. Part of FEMA responsible for the NFIP.

FIRM: See "Flood Insurance Rate Map".

FIS: Flood Insurance Study. A booklet that provides detailed information on a community's flood hazard areas. The FIS normally includes topographic information, floodplain and floodway data charts, study information, and stream profiles.

Flood Hazard Boundary Map (FHBM): An approximate NFIP map produced for communities that are not in the regular program or communities that have limited development potential.

Flood Insurance Rate Map (FIRM): The map provided to communities in the Regular Phase of the NFIP. It delineates a Special Flood Hazard Area or floodplain where regulations apply. FIRMs often include base flood elevations.

Floodplain: Land area subject to flooding.

Floodproofing: Protection measures made to a building that is not elevated above the flood level to ensure that floodwaters do not damage it. Dry floodproofing consists of ensuring that the walls and floor are watertight and capable of withstanding hydrostatic pressures and hydrodynamic forces. Wet floodproofing permits water to enter the building and seek its own level to alleviate hydrostatic pressure.

Floodway: The channel of a river and the portion of the floodplain that carries most of the flood. Regulations require that the floodway be kept open so that flood flows are not obstructed or diverted onto other properties.

Floodway Data Table: The table provided in the flood insurance study which provides detailed information for each cross section on streams studied in detail.

404 Permit: A permit required by Section 404 of the Clean Water Act to protect rivers and adjacent wetlands from being filled. The U.S. Army Corps of Engineers administers this permit program.

Freeboard: An extra margin of safety added to the base flood elevation to protect structures from waves, debris, or other unpredictable hazards that accompany the base flood.

Hydraulics: The study of moving water. The hydraulic analysis in a flood insurance study calculates how high and how fast a flood discharge flows.

Hydrodynamic Forces: The forces on a structure from current, waves, ice, etc.

Hydrology: The science dealing with the waters of the earth. A hydrologic study calculates flood discharges.

Hydrostatic Pressure: The pressure that standing water places on the walls and floor of a structure. Hydrostatic pressure of 3-4 feet of standing water can collapse walls or buckle basement floors.

LOMA: Letter of Map Amendment that FEMA issues for a structure or parcel of land that was inadvertently included in the floodplain, thereby waiving the mandatory flood insurance purchase requirements of most lending institutions.

LOMR: Letter of Map Revision. FEMA issues LOMR when changes to the effective floodplain map are made such as floodway/floodplain boundaries, base flood elevations, or authorized fill.

Lowest Floor: The lowest floor of the lowest enclosed area (including basement) of a building. Note: An unfinished or flood resistant enclosure other than a basement area used solely for parking vehicles, building access or storage, is not considered a building's lowest floor provided that such an enclosure is built in accordance with the floodplain ordinance.

Manufactured Home: Transportable structure of one or more sections, which is built on a permanent chassis and is designed for use with or without a permanent foundation when attached to the required utilities. The term "manufactured home" does not include a "recreational vehicle."

NFIP: National Flood Insurance Program

NGVD: National Geodetic Vertical Datum used by the National Flood Insurance Program. NGVD is based on mean sea level and has also been called "1929 Mean Sea Level."

Ponding: Flooding condition caused when rain runoff pools in a location that has no ready outlet. Ponding water usually stands until it is able to seep into the ground. Its a common problem in levee areas, flat areas, and in communities where construction of streets and other development has blocked the natural outlets.

Profile: A graph showing the water surface elevations of a flood at any particular location along the stream.

"Q": An abbreviation used by engineers to stand for discharge, usually given in cubic feet per second (cfs).

Recreational Vehicle: A vehicle that is:
(a) Built on a single chassis;
(b) 400 square feet or less when measured at the largest horizontal projection;
(c) Designed to be self-propelled or permanently towable by a light duty truck; and
(d) Designed primarily not for use as a permanent dwelling but as temporary living quarters for recreational, camping, travel, or seasonal use.

Riverine: Produced by a river. Riverine floodplains have readily identifiable channels and are regulated differently than floodplains caused by ponding, sheet flow or lake shore flooding.

Roughness: In flood studies, a factor that accounts for surface conditions that affect flood flows. A floodplain with a lot of trees and brush will have a high roughness factor while open spaces and paved areas will have law roughness factors.

SFHA: Special Flood Hazard Area. The term used by the National Flood Insurance Program for the floodplain identified on the flood insurance maps.

Structure: A walled and roofed building including a gas or liquid storage tank that is principally above ground.

Substantial Improvement: There are three occasions when work on an existing building is considered a substantial improvement:
1. An improvement made to a building that exceeds 50% of the value of the building.
2. Reconstruction or repair of a building, that exceeds 50% of the value of the building before it was damaged.
3. Additions to an existing building when the addition increases the market value of a structure by more than 50% or the floor area by more than 20%.

Note: If a building is substantially improved, then it must be protected from the base flood.

Topographic Map: A map showing elevation contour lines.

Uplift: Hydrostatic pressure placed on a floor as water below the floor tries to rise.

Use Permit: A permit issued after a development project is complete and the property has passed all the necessary inspections. Depending on the local ordinance provisions, a building cannot be occupied nor can a site be used unless a use permit or a certificate of use and occupancy is issued by the building official.

Variance: A request to be relieved of one or more ordinance requirements because the ordinance affects the property in a unique and special way.